WEATHER ON THE NORTH PACIFIC OCEAN

By WILLIS E. HURD

Atmospheric pressure.—During much of December a more or less continual series of depressions, many of them of great depth, crossed the northern waters of the Pacific, the most of their centers in passage running a little south of the Aleutian Islands. The average center of these LOWS, so far as daily barometer values indicate, was near the eastern Aleutians. At Dutch Harbor the average pressure for the month was 992.2 millibars (29.3 inches), which is 8.8 millibars (0.26 inch) below the December normal. Pressure was abnormally low over probably all the eastern part of the ocean. Even at San Francisco with an average of 1,013.5 millibars (29.93 inches), the departure from normal was as great as −6.5 millibars (0.19 inch).

The lowest barometer reported for the month was 962.5 millibars (28.42 inches) read on the Japanese M. S. *Kansai Maru* on the 23d, in 45°36′ N., 45°30′ W.

Consequent upon the considerable cyclonic activity which overspread the eastern as well as the northern waters of the Pacific, the anticyclone usually existing west of California retreated to the westward and lay as a rather narrow belt extending from near Midway Island to the China coast. In lower Japanese waters abnormally high pressure prevailed. At Naha the month's average barometer, 1,020.5 millibars (30.14 inches), was 5.3 millibars (0.16 inch) above the December normal.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure at sea level, North Pacific Ocean, December 1940, at selected stations*

Stations	Average pressure	Departure from normal	Highest	Date	Lowest	Date
	Millibars	*Millibars*	*Millibars*		*Millibars*	
Barrow	1,010.1	−6.6	1,034	15	993	4,27
Dutch Harbor	992.2	−8.8	1,017	28	972	23
St. Paul	997.7	−4.0	1,023	14	982	26
Kodiak	995.8	−5.2	1,012	9	969	17
Juneau	1,004.7	−4.1	1,035	10	985	22
Tatoosh Island	1,011.2	−3.4	1,032	9	979	24
San Francisco	1,013.5	−6.5	1,025	1	993	24
Mazatlan [1]	1,012.7	−0.8	1,015	4,17,19,21	1,008	26
Honolulu	1,014.2	−2.1	1,019	26	1,006	14
Midway Island	1,018.6	+2.3	1,029	24	1,003	20
Guam	1,010.5	−1.0	1,020	23	1,000	8
Manila	1,012.2	+1.0	1,016	18	1,006	5
Hong Kong	1,021.7	.....	1,026	29	1,019	15, 22, 24
Naha	1,020.5	+5.3	1,025	28	1,016	16
Titljima	1,017.2	+1.3	1,025	22	1,010	12
Petropavlovsk [2]	1,006.0	+2.9	1,027	12	979	26

[1] For 21 days. [2] For 22 days.

NOTE.—Data based on 1 daily observation only, except those for Juneau, Tatoosh Island, San Francisco, and Honolulu, which are based on 2 observations. Departures are computed from best available normals related to time of observations.

Extratropical cyclones and gales.—December 1940 will long be remembered as an exceptionally stormy month over the eastern part of the North Pacific Ocean. Along the eastern three-fourths of the routes between the Hawaiian Islands and the coast of the United States, rough weather and fresh to whole gales were of almost daily occurrence from the 14th to the 28th. Along the coast itself from mid-California northward to Vancouver, sea and air combined, over the latter part of the period, to create a condition of general storminess unequaled in previous recent years.

Along the upper western steamer routes, reports of gales, while far less frequent, indicate that winds of high intensity—force 11 to 12—occurred on at least 4 days, the 2d, 13th, 14th, and 30th, resulting in some delays and minor damages to shipping. It was only from middle longitudes of the ocean, between about 160° and 175° W., that reports indicate a condition of much more moderate weather, with only scattered gales of force 8 to 9.

December was notably a month in which a rapid succession of cyclonic disturbances crossed northern waters, and in which a number of other storms formed or reached their height of activity over the ocean's eastern quarter in more middle latitudes. The table of storms and gales, from which it has been necessary to exclude a considerable number of reports of lesser gales, gives a good idea of storm frequency and distribution. Mention may be made of a few of the more important storms.

On December 1 a cyclone was developing east of the Kuril Islands. By the 2d, central near 50° N., and the 180th meridian, it had developed into a deep storm, and on that day the American S. S. *Washington* encountered a westerly gale of force 11, barometer 977.3 millibars (28.86 inches), near 44° N., 176° E. Thereafter the disturbance weakened and, moving rapidly eastward, lay over the upper part of the Gulf of Alaska on the 5th and 6th, no longer affecting the weather along the main-traveled routes.

Two cyclones, one on the 9th and the other on the 12th, left the vicinity of the Kuril Islands and, proceeding eastward, resulted in initiating the stormy weather period to the westward of the United States. The earlier was of considerable depth at the beginning of its oceanic course, one vessel reporting a barometer of 978.9 millibars (28.9 inches), on the 9th, near 43° N., 152° E. Other ships, within a few hundred miles of the center on the late 9th and during the 10th, reported scattered gales of force 8 to 10. By the 13th, following a crossing of middle longitudes unmarked by reported gales, the storm area has expanded to enormous width, extending from near the Peninsula of Alaska almost to the Hawaiian Islands and causing widely scattered gales in southern and eastern quadrants. The highest reported wind was of force 10, encountered near 44° N., 150° W. On the 14th to 16th the center of the wide storm area moved irregularly within the region of about 38° to 47° N., 135° to 150° W., causing widespread gales of force 8 to 10, more particularly along the middle two-thirds of the California-Hawaiian routes. During these days the lowest barometer reported was 973.9 millibars (28.76 inches), read on the Japanese M. S. *Arimasan Maru* near 41° N., 143° W., on the 14th. The southward extent of the storm may be indicated by the report from the American S. S. *Maliko* of a northwest gale of force 10 late on the 15th near 30° N., 140° to 142° W. The eastward extent may be gaged from the report of another vessel on the same date of moderate southwesterly gales and barometer depressed to 995.9 millibars (29.41 inches), near 33° N., 130° W. By the 17th the storm lay off the Oregon coast, and there, in the early morning, in 42°42′ N., 124°42′ W., the American S. S. *Victor H. Kelly* had a southerly gale of force 9, with barometer at 987.5 millibars (29.16 inches).

Meanwhile, the second storm alluded to, that of the 12th near the Kuril Islands, early displayed great energy, for on the 13th, within the region, 40° to 45° N., 152° to 157° E., two American vessels, the *Collingsworth* and the *Aurora*, encountered violent westerly gales (force 11–12) with low barometer. As the storm moved eastward, lesser local gales were reported along its course. By the 18th and 19th a large area of the northeastern part of the ocean from southwestern Alaska to the Washington and Oregon coasts was affected by it. On the 18th west to southwest gales of force 8 to 9 occurred as far south as the 28th parallel, near 148° W., while to the northward,

near 45° N., 140° to 150° W., in the midst of the stormy weather, pressures as low as 965 millibars (28.5 inches) were reported. On the 19th gales of force 9 were observed at various points from near the Alaska Peninsula to the coast of Oregon.

No sooner had this vast storm area receded northward to the Gulf of Alaska, than a secondary LOW appeared near 35° N., 140° W., on the 20th, accompanied by fresh to strong gales in the vicinity. On the 21st the storm center lay at some distance off the north-central coast of California, attended by heavy weather at sea, and by violent gales of force 11 to 12 close in along the coast from northern California to Vancouver Island. At North Head, Wash., the wind attained its maximum velocity of 84 miles from south on that date, while at Tatoosh Island the highest speed, 88 miles from south, occurred on the 22d. On land extensive damage was done by the strong winds, and the accompanying heavy rains and floods, and off the coast several small vessels lost their lumber cargoes and were placed in precarious situations.

The center of this storm entered the British Columbia coast on the 22d, but stormy weather continued in less degree far to the southward, and a new LOW to the westward was further threatening the storm-beaten region. This LOW, central about midway between Washington and the eastern Aleutians on the 22d, spread eastward and southward during the 23d and 24th, accompanied by widespread gales in a broad region over which pressure fell far below 982 millibars (29 inches). While the wind velocities in American coastal waters did not attain the height reached on the 21st and 22d, they were nevertheless strong. Many instances of force 10 gales were reported at sea on the 23d and 24th, and on the latter date the extreme northwest-southeast range over which whole gales were scatteringly reported, was from about 50° N., 155° W., to about 33° N., 127° W. The general wind intensity near the Oregon coast may be indicated by the report of the American S. S. *Mauna Kea,* Portland to Honolulu. This vessel, storm beaten from the 23d to 25th, encountered her highest wind, a south gale of force 10, barometer 967.5 millibars (28. 57 inches), on the early morning of the 24th, near 45° N., 128° W.

During the 25th and 26th, as the storm slowly moved northward, conditions ameliorated in west coast waters, but the seas continued high, and some gales of force 9 continued off the Oregon coast and vicinity. On Christmas Eve, according to newspaper accounts, while the schooner *Stanwood* was in distress off Point Arena, 10 Coast Guardsmen set out to her rescue in motorboats. They became involved in the high seas and poor visibility and were lost to observation. They finally were themselves rescued, some 36 hours later, following a long and arduous search, during which another rescue vessel reached the *Stanwood.*

During the 27th a cyclone developed about midway between the Hawaiian Islands and Lower California. On that day the American S. S. *Manoa* had a northeast gale of force 9 near 28° N., 137° W. The storm deepened on the 28th, and at about 34° to 35° N., 132° to 133° W., both the *President Cleveland* and the *Maunalei* had northerly gales of force 10. On the 29th, as the storm neared the southern coast of California, the U. S. S. *Kanawha,* with a barometer of 988.2 millibars (29.18 inches), experienced a northwesterly gale of force 9 in 30°30′ N., 125°30′ W. During the night of the 29th–30th, the disturbance entered the coast as a mere depression.

The month closed with a storm of the 30th and 31st in northern waters, accompanied on the 30th by winds of force 10 to 11 within the region of about 42° to 48° N., 165° to 175° E., and scattered gales of less force to the southward.

Tropical cyclones.—Subjoined in a report by the Reverend Bernard F. Doucette, Weather Bureau, Manila, P. I., of four typhoons of the month in Far Eastern waters.

Tehuantepecers.—In the Gulf of Tehuantepec northeasterly gales associated with high pressure to the northward, occurred as follows: of force 7 on the 17th, of force 8 on the 5th, and of force 9 on the 2d.

Fog.—Very little fog was encountered far at sea. Ships reported it on 3 days off the Washington and Oregon coasts, on 13 days off the California coast, and on 2 days off the upper coast of Lower California.

TYPHOONS AND DEPRESSIONS OVER THE FAR EAST

By BERNARD F. DOUCETTE, S. J.

[Weather Bureau, Manila, P. I.]

Typhoon, December 2–7, 1940.—This storm appeared to intensify very quickly in a low-pressure area between Yap and Mindanao. It moved west-northwest to a position close to and east of central Samar and then continued on a westerly course across the Visayan Islands into the China Sea. This course was very close to and south of Catbalogan, Samar Province, close to and and north of Capiz, Capiz Province, and within 60 miles of the southern part of Mindora Island. Over the China Sea, it changed its direction to the west-northwest until the afternoon of December 6 when it began moving along a southwesterly course to the region about 100 miles east of southern Indochina, where it disappeared December 7.

At Barongan, Samar Province, the barometric minimum was 739.87 mm. (986.4 mb.) with southwest winds, force 6. Catbalogan, Samar Province, had 735.83 mm. (978.7 mb.) with north-northeast winds, force 2, at its lowest value. Capiz, Capiz Province, reported 743.92 mm. (991.7 mb.) as the minimum value. The first two stations were under the influence of the typhoon during the early forenoon hours of December 3, while Capiz experienced its share of the typhoon strength during the early evening hours of the same day.

No lives were lost, due to this storm, as far as could be learned from the daily papers, but the damage to roads and bridges due to flooded rivers was considerable.

Typhoon, December 3–13, 1940.—As a depression, this storm moved west-northwest from a position about 300 miles east of Yap, intensifying to typhoon strength, December 5, when it reached the region about 500 miles east of San Bernardino Strait. It moved westerly and then inclined to west-northwest when approaching the archipelago, a change which carried the storm center over the northern part of Catanduanes Island. The progress of the center was checked, December 7 and 8, when it was north of Camarines Norte Province and the center appeared to be recurving to the northeast. However, it did not move very far in this direction and during the night of December 8 to 9 it reversed its course and moved rather rapidly toward the southwest. The center, violent over a small area, passed between Capalonga and Daet, Camarines Norte Province, then over the Bondoc Peninsula and north of Marinduque Island. It continued weakening as it moved, and passed over the central or northern part of Mindoro Island on its way to the China Sea. It moved westerly away from the archipelago and shifted to the southwest 1 day before it disappeared east of southern Indo China, December 13.